



Rossiinae (Mollusca, Cephalopoda) from the Strait of Sicily

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KEY WORDS: Mediterranean Sea, Strait of Sicily, Cephalopoda, Rossiinae.

RIASSUNTO Vengono descritte la presenza e la distribuzione batimetrica di *Rossia macrosoma* e *Neorossia caroli* nello Stretto di Sicilia, utilizzando i dati raccolti durante campagne sperimentali di pesca con rete a strascico effettuate negli anni 1985-87 e 1992. Per ciascuna specie vengono anche analizzate la composizione per sesso e la maturità sessuale. Entrambe le specie risultano ampiamente distribuite nell'area di studio anche se i dati raccolti non sembrano in favore di una loro massiccia presenza nella zona. Maschi e femmine abitano gli stessi fondali e la loro concentrazione si verifica negli intervalli batimetrici preferiti dalle specie secondo quanto riportato in letteratura. Le femmine sono risultate più grandi dei maschi e la presenza di individui maturi durante tutto l'anno tende a confermare l'esistenza di un periodo riproduttivo continuo per entrambe le specie. *Rossia macrosoma* e *Neorossia caroli* sono state catturate per lo più assieme nell'intervallo batimetrico di sovrapposizione delle rispettive distribuzioni ed in concomitanza con *Sepietta oweniana* e *Rondeletiola minor*.

ABSTRACT The presence and bathymetric distribution of *Rossia macrosoma* and *Neorossia caroli* in the Strait of Sicily are described. Data were collected during bottom trawl surveys carried out within the years 1985-87 and 1992. Both species show a wide distribution within the area, even though captures were never abundant, and occur mostly together and with *S. oweniana* and *R. minor*. Females reach larger sizes than males and for both species an extended reproductive period is conceivable.

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INTRODUCTION

The subfamily Rossiinae Appellöf, 1898 (Cephalopoda, Sepiolidae) includes relatively small (mantle length up to 10 cm; REID, 1991), essentially benthic sepiolids (NAEF, 1923; MANGOLD WIRZ, 1963a; NESIS, 1987), though few records of captures of some species in mid-water do exist (see BELLO and BIAGI, 1995 for a review).

Three genera are currently recognised: *Rossia* Owen, 1835, *Neorossia* Boletzky, 1971 (monotypic) and *Semirossia* Steenstrup, 1887. *Austrorossia* Berry, 1918, in fact, reported as a genus by NESIS (1987), is considered as a sub-genus of *Rossia* by more recent literature (REID, 1991; GUERRA, 1992).

Only *Rossia* and *Neorossia* are represented in the Mediterranean Sea, by *Rossia macrosoma* (Delle Chiaje, 1830) and *Neorossia caroli* (Joubin, 1902). These sepiolids are characterised by having the dorsal mantle edge free, relatively wide fins, no luminous glands and both dorsal arms hectocotylized in males and are easily distinguishable from the members of the two other Sepiolidae subfamilies also by size (i.e. Sepiolinae and Eteroteuthinae are much smaller) and flesh "consistence".

Usually a by-catch of demersal fishery, *Rossia macrosoma* and *Neorossia caroli* are rather common species in the western Mediterranean, even though official statistics on their abundance are lacking (MANGOLD and BOLETZKY, 1987), and they are commercialised both fresh and frozen. Detailed information on the biology of these species is given by MANGOLD WIRZ (1963 a; b) for the Catalan Sea, and some data exist for the Adriatic and the Ionian Sea (BELLO and MOTOLESE, 1983; BELLO, 1987), but less information is available for the eastern Mediterranean (D'ONGHIA *et al.*, 1994), where no data on the presence of *N. caroli* were recorded.

In the Strait of Sicily all sepiolids are marketed under the generic commercial category named "cappuccetto" (RAGONESE and JEREB, 1990) and captures can be quite consistent along the southern coast of Sicily (ANDREOLI *et al.*, 1995) even though specific statistics are lacking. Nevertheless information on this

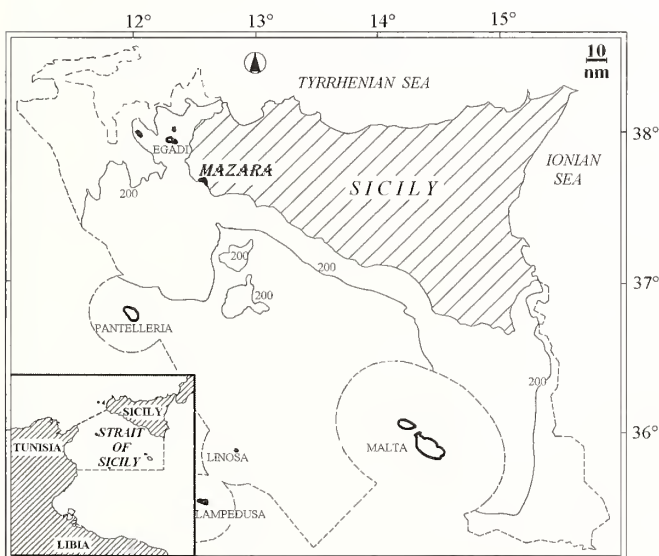


Figure 1 - Illustration of the studied area (dashed line) within the research programme T.R.A.W.L. The small square shows the area officially defined as the Strait of Sicily by Cassio (1993).

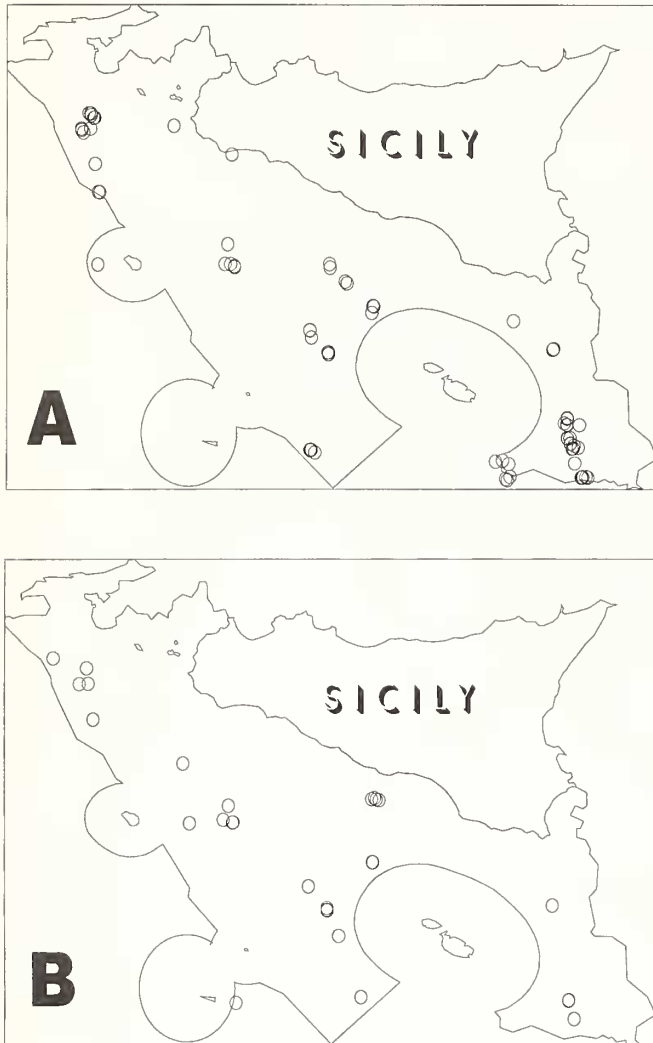


Figure 2 - Species distribution within the studied area. A) *Rossia macrosoma*. B) *Neorossia caroli*.

group within the area were definitely limited till the last decade (ARENA, 1985; RAGONESE and JEREB, 1990). A first systematic list of cephalopod species of the Strait of Sicily was recently prepared, including sepiolids (JEREB and RAGONESE, 1994). Then a more detailed study on the Sepiolidae was undertaken and some results were already given (JEREB and DI STEFANO, 1995; JEREB *et al.*, 1997; JEREB *et al.*, in press).

Here information gathered on the distribution, frequency and maturity conditions of *R. macrosoma* and *N. caroli* from the Strait of Sicily is reported.

Material and methods

Data come mainly from 8 trawl surveys carried out with seasonal periodicity from May-June 1985 to February-March 1987, within the research project T.R.A.W.L. (LEVI, 1991). Some additional material was provided by another survey (April 1992) framed in the same project. Within this programme a wide portion of the area officially defined as the Strait of Sicily (CASSIO, 1993), was investigated (namely from 35°10' to 38°35'

N and from 11°05' to 15°55' E; Fig. 1). Hauls (1 hour each) took place during day-time, exploring a depth range down to 800 m. Five bathymetric strata were identified: 1-50, 51-200, 201-400, 401-600 and 601-800 m, and hauls were allocated proportionally to the horizontal extent of each strata following a randomly stratified sampling method. The number of hauls varied around a medium value of 60 for each survey during the first cycle (1985-1987), and a medium value of 100 during the second cycle (1990-1992). Due to the bottoms morphology of the area, the highest percentage of hauls (about 40%) was allocated in the second stratum, while only about 10% of hauls was allocated in the first one, 15% in the third and fifth one respectively, and about 20% in the fourth one. A commercial trawler (32 m length, 197 tons gross tonnage, 1112 Hp engine) and the typical local commercial bottom trawl (18 mm mesh side cod-end) were used.

Specimens were fixed in formalin (8%) then preserved in alcohol (75%).

Dorsal mantle length (ML; mm) was measured according to ROPER and VOSS (1983), using callipers. Two maturity stages were assigned (i.e. immature/maturing and mature), based on the storage of spermatophores in males and on the egg size and appearance in females, according to the suggestions by MANGOLD WIRZ (1963a). All measurements were taken on preserved material and specimens not well preserved were not considered for measures.

A total of 305 individuals (150 males and 155 females) was examined (Tab. 1), 242 specimens belonging to *Rossia macrosoma* and 63 to *Neorossia caroli*.

Results

Rossia macrosoma

A total of 116 males and 126 females were identified (Tab. 1), captured at depths ranging between 81 and 586 m, even though the major concentration occurred in the depth strata 201-400 m and 401-600 m for males and females respectively (Tab. 1). There is some evidence that the species is present also in shallower waters (local fishermen, pers. comm.), but it needs confirmation. Both males and females were present all over the area (Fig. 2-A), mostly together with *Rondeletiola minor*, *Sepietta oweniana* and *Neorossia caroli*.

The minimum observed size was 17 mm for both sexes (immature specimens), while maximum size was 43 and 67 mm for males and females respectively (Tab. 2).

Considering the whole sample, 91% of males were mature, while the percentage of mature females was smaller (42%). The smallest mature male measured 25 mm, the smallest mature females 37 mm. Mature individuals were present all over the year, but the highest concentration of mature females occurred in summer and autumn, while a high percentage of mature males was noticeable in every season (Tab. 2).

Neorossia caroli

On the whole, 34 males and 29 females were identified, cap-



SPECIES	SEX	C (n)	Depth range		51 - 200		201 - 400		401 - 600		601 - 800	
			min	max	N	%	N	%	N	%	N	%
<i>Rossia macrosoma</i>	M	116	117 - 556	21	18	63	54	32	28	0	0	
	F	126	81 - 586	36	29	41	32	49	39	0	0	
<i>Neorossia caroli</i>	M	34	135 - 752	1	3	3	9	26	76	4	12	
	F	29	81 - 699	4	14	7	24	15	52	3	10	

Table 1 - Number (N) and percentage (%) over the total catch (C) in number (n) of specimens for each depth range (m) investigated and for sex (M: males; F: females).

SEX	SPRING						SUMMER						AUTUMN						WINTER						
	H	C	M	%	N	ML	H	C	M	%	N	ML	H	C	M	%	N	ML	H	C	M	%	N	ML	
<i>R. macrosoma</i>	M	12	30	30	100	11	25-43	6	17	13	77	4	27-34	15	35	30	77	15	30-39	15	34	33	97	9	29-38
	F	19	46	17	37	13	47-67	7	20	11	55	8	48-59	14	31	20	65	13	38-64	16	29	5	17	3	37-44
<i>N. caroli</i>	M	3	5	5	100	3	31-46	3	4	3	75	2	38-39	3	10	6	60	2	30-45	8	15	12	80	5	32-39
	F	5	8	3	37	3	42-42	4	6	2	33	1	36	6	8	5	63	4	35-60	7	7	3	43	3	43-51

Table 2 - Seasonal distribution of number, percentage and mantle length range of mature individuals, by sex. H: number of hauls in which the species were captured; C: number of specimens; M: number of mature specimens; %: percentage of mature specimens; N: number of measured mature specimens; ML: mantle length range (mm).

tured at depth ranging between 81 and 752 m (Tab. 1), the major concentration occurring in the depth stratum 401-600 m for both sexes. Males and females occurred mostly together, all over the area (Fig. 2-B). Minimum observed sizes were 21 and 23 mm (immature individuals), while maximum size ranged between 46 and 60 mm (mature individuals), for males and females respectively (Tab. 2). The smallest mature males measured 30.5 mm, the smallest mature females 35 mm.

Again, considering the whole sample, only 45% of the examined females were mature, while the percentage was higher for males (76%). Mature animals of both sexes were present all over the year, but the highest percentage of mature females was noticeable in autumn and winter, while a high percentage of mature males was noticeable in every season (Tab. 2).

Discussion

On the whole, the bathymetric distribution observed for *Rossia macrosoma* and *Neorossia caroli* in the Strait of Sicily is conform to what reported for the species in the western Mediterranean and in other Italian seas (MANGOLD WIRZ, 1963a,b; LUMARE, 1970; BELLO and MOTOLESE, 1983; BERTULETTI and ORSI RELINI, 1986; SANCHEZ, 1986; VILLANUEVA, 1995; VOLPI *et al.*, 1995; WURTZ *et al.*, 1995).

Neorossia caroli is definitely the most bathyal species among Mediterranean sepiolids, being recorded at depths down to 1744 m in the western Mediterranean (VILLANUEVA, 1992). The

upper distribution limit observed in the present case (81 m) is shallower than that usually reported for the species (MANGOLD WIRZ, 1963b; MANGOLD and BOLETZKY, 1987; GUERRA, 1992), but also recent findings in the lower Tyrrhenian Sea (WURTZ *et al.*, 1995) indicate that *Neorossia caroli* may occur on shallower bottoms than previously believed. However present records also confirm its preference for deeper waters, the major concentration being observed below 400 m.

The two species overlap in the upper and lower range of their distributions, *Rossia macrosoma* usually being found between 100 and 600 m all over the Mediterranean (MANGOLD WIRZ, 1963a) even though its presence on shallower bottoms (Atlantic, North Sea: less than 50 m; MANGOLD WIRZ, 1963a) as well as in deeper waters (down to 899 m in the Western Mediterranean; VILLANUEVA, 1995) was ascertained.

The association of *Rossia macrosoma* and *Neorossia caroli* in the captures, along with their occurrence together with *Sepietta oweniana* and *Rondeletiola minor*, was already noticed (LUMARE, 1970; VOLPI *et al.*, 1995) and indicates a preference for the same bottoms also in the Strait of Sicily.

The presence of mature individuals all over the year supports the existence of an extended reproductive period for both species (MANGOLD WIRZ, 1963a,b), even though a possible spawning peak in autumn, as observed for *Rossia macrosoma* in the Aegean Sea (D'ONGHIA *et al.*, 1994), is conceivable for both species, considering the major concentration of mature females.

As expected, females attained larger sizes than males. The observed size at maturity conforms to reports in the literature (MANGOLD WIRZ, 1963a,b; D'ONGHIA *et al.*, 1994; SARTOR and BELCARI, 1995; VOLPI *et al.*, 1995), except for *Rossia macrosoma* males: mature individuals found in the present case are the smallest ever reported (25 mm, ML). It has to be pointed out however, that measures hereby quoted were taken on preserved material.

Considering the bathymetric range inhabited by these species (which in the studied area represents a consistent portion of the investigated zone) and the fact that they are reported as quite common in other areas of the Mediterranean (MANGOLD WIRZ, 1963a,b; MANGOLD and BOLETZKY, 1987; GUERRA, 1992; VOLPI *et al.*, 1995), present records are not in favour of a massive presence of *Rossia macrosoma* and *Neorossia caroli* in the Strait of Sicily. They though indicate a wide spatial distribution for both species all over the area.

However, only targeted studies could allow to better understand the situation of these sepiolids in Strait of Sicily.



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